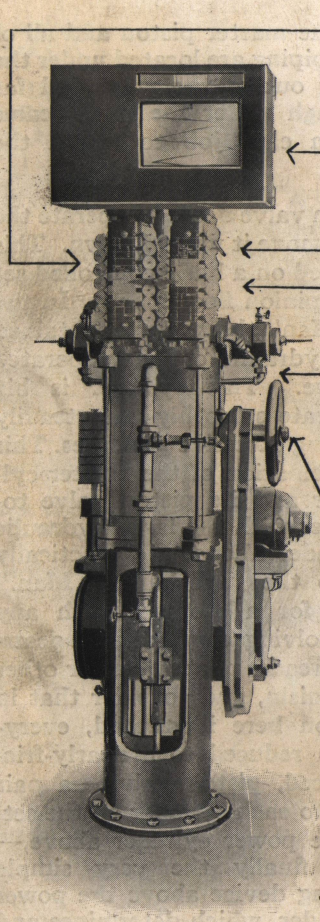
The Western Gas Construction Co.
ENGINEERS AND BUILDERS
Fort Wayne, Ind.

Bulletin 210-E

The Western Mechanical Man to operate Water Gas Sets



BRAIN—The Timer,—the frictionless oil control, no wearing parts, no delicate machinery, easy to understand and use.

MEMORY—The Recording Chart shows exactly how the set was operated.

OBEDIENCE—Perfect Responsiveness to superintendent, and to operator's needs.

HANDS—Pointers, they show the exact position of the set.

HEART—Connection to oil pump supplying *oil under pressure.*

RESERVE POWER—The Hand Control, it can be called on any instant to stop, start or modify the regular cycle, or to shut down the set.

BACKBONE—The Center of Control,—the *Master Cylinder* which directs the flow of water to the right place at the right time.

NERVES—Water Pipes below the floor leading direct to the set,—no pilot valves or auxiliary cylinders to bother with,—*direct control.*

MUSCLES—Hydraulic cylinders on all valves.

Gives Direct Control

What is a "Control"

Practically every valve on a modern gas set is operated by a hydraulic cylinder. To control these cylinders is to control the set. Such control is accomplished in the Western "Mechanical Man" in a very simple, direct manner, by the use of the master cylinder with its piston valve as here illustrated.

Piston Valve

The piston valve shown on the opposite page, is something like a hollow dumb-bell. High pressure water surrounds the "handle" or neck of the piston, and is floated up and down. The spaces above and below the piston valve are connected to the waste pipe at the bottom. The piston rod extends up through the floor and may be operated by hand or by power.

Inlet Pipes

As the piston valve floats the zone of high pressure water upward, it uncovers one port after another which immediately sends high pressure water to the hydraulic cylinders which are thus connected in. At the same instant, the "mate" of each of these ports, is being uncovered just under the bottom of the piston valve permitting water to flow freely into the exhaust space.

Complete Cycle

The return trip of the piston valve will cause the reversal of each of these cylinders as the upper ports are one by one connected to the waste space and the lower ports at the same time connected with the zone of high pressure water.

Outlet Pipes

This will be understood better by noting that the space within the hollow piston conducts water from the upper part of the master cylinder thru to the waste pipe at the bottom. Any piping connected to the ports above or below the piston, must necessarily contain low pressure water, while the "mate" from each of these pipes connecting to the central space occupied by high pressure water, must carry high pressure water.

Low Pressure Packing

The stem or piston rod is, therefore, packed against practically zero water pressure, thus reducing friction, wear and leakage; another great advantage is that should the piston wear and some of the high pressure water leak out from around the "central neck," it will be carried away immediately into the waste with no danger of confusing the proper operation of the cylinders.

Permanent Means to Secure Proper Sequence

These ports are permanently cut in the master cylinder in proper sequence for operation of the water gas set. The motion of the piston valve, therefore, must necessarily open and close the valves in the proper sequence. There is no way in which it could "get mixed-up" and open the wrong valve first.

Source of Power

The master piston and all of the piping are located under the floor out of the way, and far enough under the floor beams to make it an easy job to install the piping.

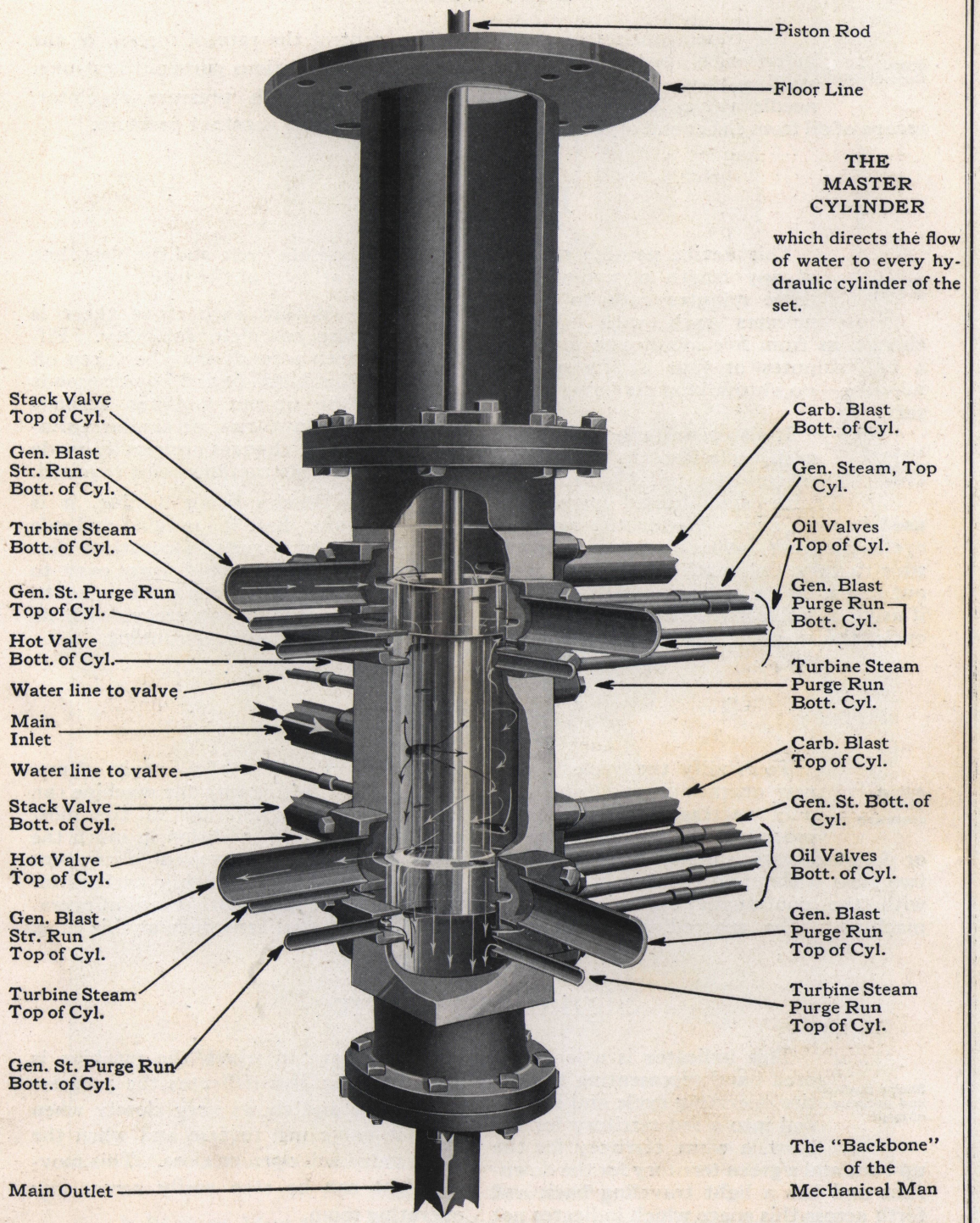
All the piston valve needs to operate the set is power to move it up and down. This power is supplied on a hand controlled set by a rack-and-pinion floor stand. In the "Mechanical Man" the power is obtained from a large hydraulic cylinder operated by oil pressure. This cylinder is big enough to operate smoothly and steadily without requiring excessive pressures. This

Nothing Complicated

combination of the master cylinder and its piston valve together with the large hydraulic cylinder above, are practically all there is to the "Mechanical Man." Compare this for a moment with any mechanism involving cams, shafts, gears, fine bolts or threads, pilot valves or other delicate mechanism, and consider that in the construction here illustrated, everything has been reduced to a nearly-frictionless, balanced, piston valve,—a pair of water pipes to each cylinder on the set,

Few Parts

—the power cylinder above,—and finally the very simple timing device above the power cylinder, which determines and regulates the speed of movement of this combination,—these are the vital elements of this simple and effective mechanism.


Piston Rod
Floor Line
THE MASTER CYLINDER
which directs the flow of water to every hydraulic cylinder of the set.
Stack Valve Top of Cyl.
Gen. Blast Str. Run Bott. of Cyl.
Turbine Steam Bott. of Cyl.
Gen. St. Purge Run Top of Cyl.
Hot Valve Bott. of Cyl.
Water line to valve
Main Inlet
Water line to valve
Stack Valve Bott. of Cyl.
Hot Valve Top of Cyl.
Gen. Blast Str. Run Top of Cyl.
Turbine Steam Top of Cyl.
Gen. St. Purge Run Bott. of Cyl.
Main Outlet
Carb. Blast Bott. of Cyl.
Gen. Steam, Top Cyl.
Oil Valves Top of Cyl.
Gen. Blast Purge Run Bott. Cyl.
Turbine Steam Purge Run Bott. Cyl.
Carb. Blast Top of Cyl.
Gen. St. Bott. of Cyl.
Oil Valves Bott. of Cyl.
Gen. Blast Purge Run Top of Cyl.
Turbine Steam Purge Run Top of Cyl.
The "Backbone" of the Mechanical Man

The Timer

Speed Control

The timer consists of a cylinder with piston and one stuffing box, provided with needle valves to regulate the escape of oil from either end of the cylinder and so control the rate of motion of the piston over the various parts of the stroke. An oil pump with pressure regulator, supplies oil under constant pressure.

Flexibility

Length of Cycle

This device permits the use of any length of cycles from three minutes each to fifteen minutes each with gradual change, as from five minutes to four and a half minutes or four and a quarter minutes,—no abrupt changes being necessary.

Make-up of each Cycle

It also permits the division of each cycle into the blast time, up run time and down run time with any desired percentage used in each step. Within the range of cycles per hour commonly used, it is possible to vary the length of the cycle without changing its make-up. For example, if using 35% blast time and a five minute cycle, the machine can be put on a four and a half minute cycle and the blast time will remain at 35% of the total.

Constant Per Cent

Within each cycle there is also complete flexibility. Fifteen seconds may be taken off the blast period, five seconds added to the up-run and ten seconds added to the down-run, or similar variations. All these changes are readily made with very little instructions being required.

Safety

Besides being flexible, it is safe. Safe for purging and safe for blow-runs. Operations that the superintendent would turn over to only his most careful men are here taken care of with absolute accuracy, with no danger of the period over-running.

Adjustments

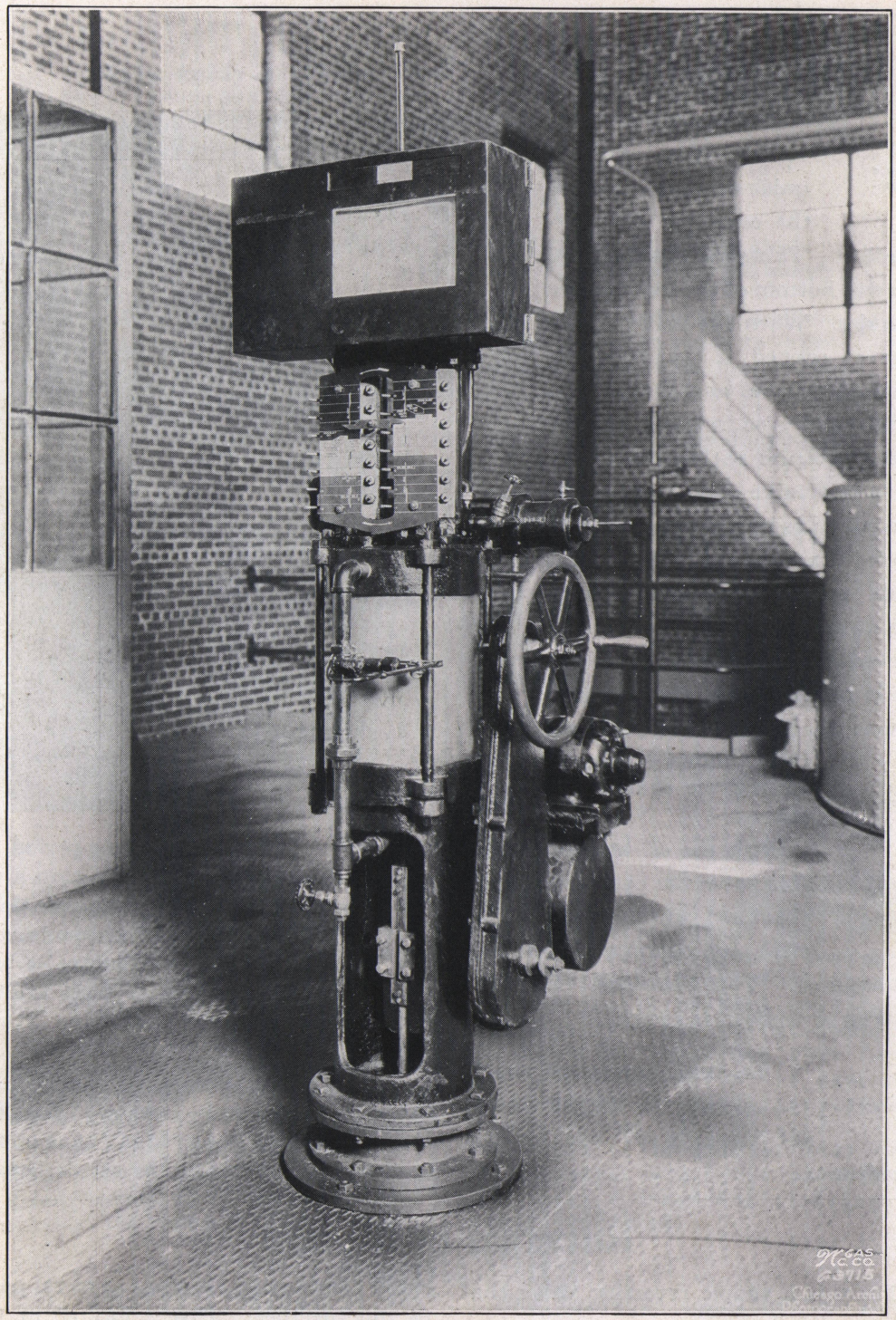
Adjust while operating

To modify the cycle to suit new operating conditions, it is only necessary to adjust the proper needle valves backward or forward very slightly during one or two runs without interfering in any way with the continuous operation of the machine. The succeeding run immediately shows the effect of the slight adjustment made. In this way the machine can be gradually brought up to the most effective operating condition in much the same manner that a musical instrument is tuned up or an automobile carburetter adjusted. The automatic record of operation is of material assistance at this time.

Signalling Device

Shows position and progress of cycle

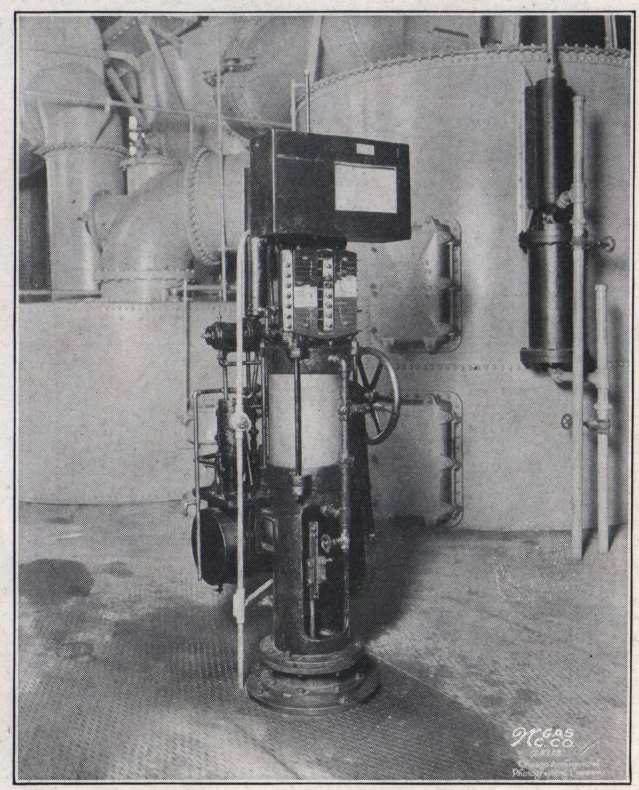
This indicator is a long colored band representing the entire operating cycle and is divided into a red territory for the blow, a white territory for the up-runs and a green territory for the down-runs and has a light traveling back and forth across this space which indicates not only the stage in which the machine is operating but also indicates the progress that stage, and shows very closely when the hot valve will reverse and when the stack valve will open or close. This moving light can be seen easily across any operating room.



"At Your Service!"

A Western Mechanical Man on the floor of a large water gas plant, connected to an 11′0″ set.

To Shut Down



Bypass Valve

The picture shows a vertical pipe with a quick-opening valve at the center of the mechanism. This pipe connects the top and bottom of the main power cylinder. When the valve in this pipe is opened it equalizes the pressure above and below the piston and also releases the oil under pressure within the timer. With this valve open no power is exerted to cause the piston rod to move; therefore the "Mechanical Man" will be at rest and will hold the water gas set as it was when the valve was opened. This feature is utilized when the operator desires to add to the blasting time immediately following the charging of the set.

Extra blast time

Hand control always available

With the oil by-passed thru this valve the operator can use the hand wheel shown at the right and control the set as may be required. This handwheel is geared back so as to operate easily.

Shut-downs

The same operations enable the operator to shut down the set instantly to care for any emergencies.

Starting a set

After the charging period (as well as when starting up a set that has been down some time) it is a very easy matter to control by hand until the generator is well heated up, the carburetter blast ignited and the set properly started on a new cycle.

Return to mechanical operation

The closing of the by-pass valve will instantly put the "Mechanical Man" back on the job, running the set as before.

Reversal of Motion

There is a simple reversing valve that causes alternate up and down motion,—it also works in oil,—everything lubricated continually, no wearing metal parts to run together. This is located at the rear of the machine and requires no attention.

Water Piping

Water supply and exhaust pipes go direct from the master cylinder to the various hydraulic cylinders, which eliminates all pilot valves and auxiliary cylinders, gives quick, snappy action and utilizes a system of piping that is easy to install and follow up.

Development

The WESTERN "Mechanical Man" is the result of long study, a gradual development during which the design has been tested, simplified and improved, step by step.

And at all times the Gas Man, the user of this equipment, has been considered. One feature, for example, that will mean much to experienced operators, is the filter system that cleans the oil before it enters the power cylinder, the reversing valve or the timer. All oil is filtered on its way in.

Another feature is small floor space and absence of exposed piping or wiring.

Valves Controlled

The WESTERN "Mechanical Man" has water ports to control the hydraulic lifts on

The Generator Blast Valve
The Carburetter Blast Valve
The Reversing ("Hot") Valve
The Stack Valve
The Generator Steam Cut-Off Valve
The Oil Cut-Off Valve
The Steam Line to the turbine (or the Power Switch of a motor driven blower.)

as well as auxiliary ports that may be used when wanted for purging and for blow-runs.

Advantages

In the larger plants, labor is saved; in the smaller plants the labor used can get results that hand operation cannot rival. In any plant, the operation can be gradually modified until maximum capacity and economy are obtained.

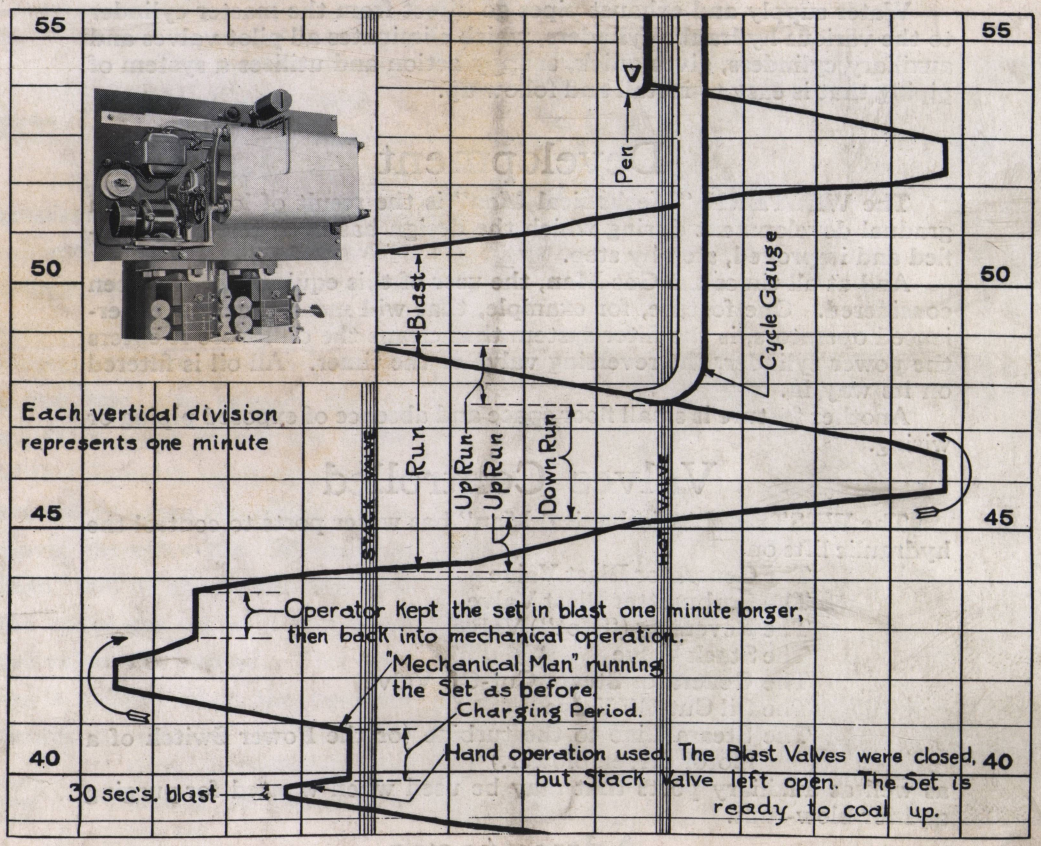
On poor fuels and with soft coal, the ability of the "Mechanical Man" to purge, make split-runs and blow-runs will be greatly appreciated.

Short blows and short runs can be made without loss of time in shifting valves because this "Mechanical Man" operates the valves in quick and accurate succession. Such close attention and fast work would rapidly exhaust a human operator. These short blows and runs take advantage of the economy due to the small percent of CO_2 during the early part of the blast and secure high capacity due to the high make of gas during the first portion of the run; also take advantage of the gain in clinkering due to blowing only short periods of time. The intense heat at the bottom of the generator does not build up when using frequent recurring short blasts as it does with less frequent longer blast periods.

Adaptability

The WESTERN "Mechanical Man" can be attached to any set, new or old, ours or a competitors, that has hydraulic cylinders.

New hydraulic equipment can also be put on any old sets not equipped throughout for complete control.



The Recording Device

The Accurate "Memory" of the "Mechanical Man"

At the top of the "Man" is a pen, geared to the main piston rod, the horizontal travel of the pen exactly proportional to the vertical travel of the rod. Behind the pen is carried the paper chart driven at a constant speed. Each space between the cross-lines represents one minute of elapsed time. The chart may be driven continuously or occasionally as desired. The records thus made *show exactly* how the set was operated. A supply of paper and ink is included with each installation.

Below the recording pen is the "cycle gauge" which is set to follow the track of the previous cycle. In a house where several machines are being kept in step, this has the advantage that the operator can leave the regular cycle a half-minute or so ahead of the end of the run, coal up, get in his extra blast and get back into step with the other machines of the plant. This "cycle gauge" is also of great advantage when "tuning up" a machine and getting the Mechanical Man adjusted to the exact cycle wanted.

The cycle gauge may be adjusted to show the exact length of cycle desired.